# 4.0 ENVIRONMENTAL CONSEQUENCES

## 4.1 AESTHETICS

Construction of the proposed power plant would produce minor short-term visual impacts related to increased activity in the area, including delivery of construction equipment and supplies, site preparation and construction work, and transit of construction workers to and from the site. Because the roads that would be used are paved, fugitive particulate emissions from vehicles traveling on the roads would be minimized. Although the amount of land that would be disturbed for the proposed plant is relatively small (approximately 5 acres), some fugitive dust associated with site preparation may be visible within a few miles of the site, particularly during dry periods with strong winds when loosened earth would be lifted and transported. However, fugitive dust would be minimized by wetting the construction area with water. Minimal vegetation would be removed during construction.

The physical presence of new facilities for the plant, such as the boiler stack and transmission lines, would not cause a major degradation to the visual characteristics at the site. The new facilities would be consistent in character with the existing viewing landscape, which includes industrial buildings, coal storage silos (257 ft height), coal piles, coal conveyors, refuse disposal ponds surrounded by earthen berms, and electric transmission lines and towers. The boiler stack (293 ft height) would be comparable in scale to the existing coal storage silos and would not represent a major visual intrusion on the current appearance of the overall site.

Mining operations at the Turris Mine to accommodate operation of the proposed power plant would not appreciably change. Work would continue to be performed under the existing permit for surface impacts from underground coal mining.

Air emissions from the boiler stack, as a result of physical and chemical processes, would have the potential to cause a plume that would be visible to human observers. Directly emitted particulate matter can scatter light. $NO_x$ emissions are chemically converted in the atmosphere to $NO_2$, a reddish-brown gas that absorbs light, and $SO_2$ emissions can be converted in the atmosphere to sulfate particles that scatter light. The combined effects of all emissions, in some cases, can result in a power plant plume that might be slightly visible upon exiting the stack or within a few miles downwind. However, because the technologies that would be incorporated into the proposed plant would be expected to capture at least 96% of $SO_2$ emissions, decrease $NO_x$ emissions by 85%, and remove 99.8% of particulate matter from a relatively small power plant generating 91 MW of electricity, any visible plume of air emissions from the proposed plant should barely be noticeable. No scenic vistas, which could potentially be adversely affected in the event that a visible plume would be created, exist in the vicinity of the proposed project.

During stable atmospheric conditions with light winds and cool temperatures, a plume of condensed water vapor rising from the cooling tower would be visible, and a condensation plume of water droplets may also be visible from the boiler stack. Even under extremely cold and stable conditions, however, the plumes of water droplets would be expected to evaporate within a few miles of the site.

In summary, visual characteristics at the site would not be altered appreciably over the long term from those that presently exist because (1) the proposed site for the power plant would be located adjacent to an area that has experienced prior human disturbance and industrial development; (2) the land area that would be disturbed for the proposed plant would be relatively small; (3) only a small amount of grassy vegetation would be disturbed; (4) the physical structures to be constructed would be similar to existing facilities at the adjacent Turris Mine; (5) electricity generated by the proposed power plant would be exported from the existing substation at the site using existing transmission lines; (6) plumes of air emissions from the proposed plant should barely be visible and infrequent condensation plumes should evaporate within a few miles of the site; and (7) other land use in the area surrounding the proposed project site is primarily agricultural with no scenic vistas or aesthetic landscapes.

## 4.2 ATMOSPHERIC RESOURCES

The following sections present the potential air quality impacts that could result from construction and operation of the proposed power plant. The significance of impacts is presented in relationship to criteria that have been established for protection of public health and welfare and the environment.

### 4.2.1 Construction

During construction, temporary and localized increases in atmospheric concentrations of nitrogen dioxide ($NO_2$), carbon monoxide (CO), sulfur dioxide ($SO_2$), volatile organic compounds (VOCs), and particulate matter would result from the exhausts of workers' vehicles, heavy construction equipment, diesel generators, and other machinery and tools. Construction vehicles and machinery would be equipped with standard pollution control devices to minimize emissions, which would be very small compared to regulatory thresholds typically used to establish requirements for air quality impact analysis.

Fugitive dust would result from excavation and earthwork. The impacts of this dust on off-site ambient air concentrations of particulate matter were modeled using the EPA-recommended Industrial Source Complex Short-Term (ISCST3) air dispersion model (EPA 1995b) with Plume Rise Model Enhancements (ISC-Prime). An average emission factor of 1.2 tons of total suspended particulate matter per acre per month (EPA 1985) was assumed to result from site construction activities, with 30% of the mass expected to consist of particles less than 10 μm in diameter ($PM_{10}$) (Kinsey and Cowherd 1992). The maximum land area disturbed at any one time was assumed to be 7 acres. Application of water from the existing fresh water pond at the Turris Mine was assumed as a standard practice for dust suppression, which would reduce fugitive dust by 50% (EPA 1985), and construction activities would be performed during daylight working hours.

Meteorological data from Springfield, Illinois, in conjunction with corresponding upper-air data from Peoria for the year 1991, were used for the screening analysis of construction impacts. Springfield is the nearest location at which quality-assured hourly meteorological data are archived. Because the terrain in central Illinois is relatively flat and homogeneous, meteorological data at Springfield would be representative of conditions at the site of the proposed power plant. The Peoria site provides the nearest upper-air data, which represent large-scale meteorological conditions and are relatively uniform over large regions, especially where the terrain is relatively flat. Therefore, upper-air data from Peoria would be representative of upper-air conditions at the plant site. Because pollutant concentrations from ground-level releases of fugitive dust decrease with distance from the source, concentrations were modeled at a circular grid of receptor locations near the edge of the proposed construction area (where maximum concentrations would be expected to occur) and not at more distant locations.

Results for the sum of modeled concentrations from project construction and the ambient background concentration (Table 3.2.1) indicated that no exceedances of the NAAQS for 24-hour averaged $PM_{10}$ would be expected beyond about 300 ft from the edge of the construction area. Results for annual averaged $PM_{10}$ indicated that the sum of modeled and background concentrations would be less than 70% of the corresponding NAAQS at 300 ft from the edge of the construction area. However, since modeling for the annual averaged $PM_{10}$ concentration assumed continuous earthwork for a full year, which would not occur, the annual averaged $PM_{10}$ concentration would be less than predicted by the model.

### 4.2.2 Operation

#### *4.2.2.1 Ambient Air Quality Impacts from Criteria Pollutant Emissions*

Prevention of Significant Deterioration (PSD)

PSD increments would provide indications of the potential for the proposed plant to affect human health and the environment. As noted in Section 3.2.2, the nearest PSD Class I area, for which the allowable degradation of air quality is severely restricted, is Mingo Wilderness Area, located about 210 miles south-southwest of the proposed plant site. Although PSD analysis is not required for Class I areas beyond 60 miles from an emission source, modeling results indicated that emissions from the proposed power plant would have little, if any, effect on pollutant concentrations in the ambient air. Further, winds in the vicinity of Elkhart (Figure 3.2.1) would usually transport pollutants in directions that would not affect the Mingo Wilderness Area. Therefore, the following analysis focuses on maximum allowable increments for PSD Class II areas.

Emissions of air pollutants from the proposed power plant would be discharged primarily through the combustion boiler stack. Other potential pollution sources during operation would include plant vehicular traffic and personal commuter vehicles; however, the small volume of traffic associated with plant operation would not contribute appreciably to ambient-air pollutant concentrations in the area and therefore was not included in the emission totals for the PSD modeling analysis.

Potential air quality impacts of emissions from the boiler stack at the proposed power plant were evaluated using the ISC-Prime air dispersion model. Effects of downwash, which would reduce the rise in elevation of a plume due to aerodynamic effects of buildings or other structures near a stack, were included in the modeling. The following stack values were used as input parameters for air quality impact modeling: stack height of 89.3 meters (293 ft), diameter of 2.04 meters (6.7 ft), exit temperature of 322°Kelvin (49°C or 120°F), and exit velocity of 15.23 meters per second (50 ft per second). Model input included five years (1987-1991) of hourly meteorological data from Springfield, augmented by corresponding (twice daily) upper-air data from Peoria.

Concentrations were modeled at each point (receptor) on two receptor grids that were developed by Harza (2001). A fine receptor grid covered a 0.6 × 0.6 mile area centered at the site of the proposed power plant; receptors within this grid are located at 330 ft intervals. A coarse grid surrounding the site of the proposed power plant would cover a 6 ×6 mile area with receptors at 1,640 ft intervals. The nested grids allow both a relatively intense analysis near the site of the proposed plant and a more general analysis of air quality in the region.

PSD increments have been established for $SO_2$, $NO_2$, and $PM_{10}$ (Section 3.2.2). For short-term (3 hour and 24 hour) averaging periods, the PSD requirements allow for one anomalous exceedance of the standards per year (40 CFR 51.166); therefore the highest modeled 3 hour and 24 hour concentrations at each receptor location for each year were excluded, and the highest remaining values resulting from application of the 5 years of meteorological data were used. The analysis shows that modeled concentrations would always be less than 30% of the allowable PSD increments (Table 4.2.1).

**Table 4.2.1. Prevention of Significant Deterioration (PSD) impact analysis for the proposed power plant at Elkhart, Illinois**

| Pollutant | Averaging period | PSD Class II increment[a] (μg/m³) | Modeled concentration increase (μg/m³) | Location of maximum concentration increase[d] | Percentage of PSD Class II increment |
|---|---|---|---|---|---|
| $SO_2$ | 3 hour | 512 | 91[b] | 0.6 mi E | 18 |
| | 24 hour | 91 | 25[b] | 1.4 mi WNW | 27 |
| | Annual | 20 | 2[c] | 0.6 mi ENE | 10 |
| $NO_2$ | Annual | 25 | 1[c] | 0.6 mi ENE | 4 |
| $PM_{10}$ | 24 hour | 30 | 2[b] | 0.1 mi SE | 7 |
| | Annual | 17 | 0.3[c] | 0.1 mi SSE | 2 |

[a]PSD increments are standards established in accordance with the Clean Air Act provisions to limit the degradation of ambient air quality in areas that have attained the National Ambient Air Quality Standards.

[b]For averaging periods less than one year, one exceedance per year is allowed (40 CFR 51.166); therefore, the highest modeled concentration for each year has been excluded, and the highest of the remaining concentrations over the 5-year modeling period is listed.

[c]Maximum modeled annual concentration.

[d]Miles and direction from boiler stack.

A detailed PSD analysis for regulatory applications may consider other sources in the area (as determined from 40 CFR 51.166) that are potentially contributing to the degradation of air quality. Emissions of $NO_2$ and $PM_{10}$ from other sources in the region are more than 10 times the emissions that would be expected from the proposed power plant; therefore, emissions from those other sources resulted in appreciable increases in modeled concentrations, especially at locations close to those sources. For example, near Decatur (about 25 miles east-southeast of the plant site), where other PSD sources are dominant, concentrations were modeled to be about 35% of the $PM_{10}$ increments and slightly above 20% of the $NO_2$ increment. However, modeled contributions from the proposed plant were minuscule at that location.

A detailed PSD analysis, including the cumulative effects of the proposed plant and other sources in the region, has been performed for $SO_2$ and summarized in the PSD permit application (Harza 2001); the results indicate that no violations of PSD increments for $SO_2$ would be expected. Because modeling of $NO_x$ and $PM_{10}$ emissions from the proposed power plant resulted in maximum concentration impacts that were substantially less than their respective significant impact levels, additional PSD modeling of $NO_x$ and $PM_{10}$ emissions from the proposed power plant in combination with emissions from other sources in the region was not required.

Following analysis of the PSD permit application (Harza 2001), the Illinois Division of Air Pollution Control issued a draft permit on June 17, 2002, for public review. The public review process included a public hearing on August 1, 2002, in Elkhart, IL, during which all commenters either supported the proposed project or provided inquiries regarding project schedules or possible employment opportunities. The Division of Air Pollution Control issued a construction permit for the proposed power plant on December 17, 2002. A copy of the permit is provided in Appendix D.

National Ambient Air Quality Standards

Pollutants for which National Ambient Air Quality Standards (NAAQS) exist (criteria pollutants) include $SO_2$, $NO_2$, CO, $O_3$, Pb, and two size classes of particulate matter ($PM_{10}$ and $PM_{2.5}$). The ambient air concentrations of CO are primary concerns near major intersections in large cities, where many vehicles are concentrated within a relatively compact geographic location and where idling and air circulation is limited by surrounding high-rise buildings. The ambient CO concentrations in the Elkhart area are less than 30% of the 8 hour NAAQS (ambient level of 2,760 $\mu g/m^3$ compared with a standard of 10,000 $\mu g/m^3$) and less than 20% of the 1 hour NAAQS (ambient level of 7,360 $\mu g/m^3$ compared with a standard of 40,000 $\mu g/m^3$) (Table 3.2.1). Because the emission rate of CO from the proposed power plant would be less than 80% of the emission rate for $SO_2$ (Table 2.1.1), which resulted in modeled maximum increases in $SO_2$ of only hundreds of $\mu g/m^3$ in ground concentrations, the CO emissions from the power plant would not be expected to increase ambient air CO concentrations to levels that would exceed (or even approach) the NAAQS. Therefore, CO emissions from the proposed plant were not evaluated further.

No appreciable Pb emissions would be expected from construction or operation of the proposed power plant. Ambient air concentrations of Pb in recent years have been well below the NAAQS (Table 3.2.1), largely as a result of decreased use of leaded gasoline in automobiles.

The standards for $PM_{2.5}$ have only recently been established (62 *FR* 138) and have not yet been fully implemented. Ambient air concentration data for comparison with the $PM_{2.5}$ standards, which apply to 3 year averages, are not yet available.

Impacts of $O_3$ expected to result from operation of the proposed power plant are discussed as regional-scale impacts in Section 4.2.2.2.

The remaining analyses in this section address the potential impacts that would result from emissions of $SO_2$, $NO_2$, and $PM_{10}$.

Potential cumulative impacts on air quality were evaluated by using an air dispersion model to estimate the maximum increases in ground-level concentrations of pollutants resulting from the combined emissions of the proposed power plant and other regional sources (PSD sources and non-PSD sources). The modeled maximum ground level concentration was added to measured background (ambient air) concentrations (Table 3.2.1) and compared to NAAQS limits. Consistent with the PSD analysis, the ISC-Prime air dispersion model was used for estimating pollutant concentrations, and 5 years (1987-91) of meteorological data were used.

Pollutant concentrations were modeled for the same two receptor grids (0.6 × 0.6 mile and 6 × 6 mile) used for the PSD analysis. For $PM_{10}$, however, the grid did not include receptors within 3,000 ft of the Turris Mine. Although $PM_{10}$ concentrations may be high at locations near the Turris Mine, members of the general public would not receive extended exposures at those locations because the nearest residences are located about 4,000 ft from the mine boundary (Section 3.11).

Maximum pollutant concentrations resulting from operation of the power plant in conjunction with pollutant concentration resulting from emissions from other existing sources within 30 miles are presented in Table 4.2.2. Because modeled contributions of emissions from the plant to air pollutant concentrations would be small compared with modeled contributions of combined emissions from the plant and existing regional sources, even near the plant site, the modeled concentrations shown in Table 4.2.2 were dominated by other sources in the region (e.g., the Turris Mine for $PM_{10}$, and the Kincaid Generating Station in Kincaid and the A.E. Staley Manufacturing Company in Decatur for $SO_2$ and $NO_2$). Specifically, the prevalence of other regional sources is indicated by comparing the modeled concentrations and their locations in Table 4.2.1, which are based on emissions from only the boiler stack at the proposed facility, with those in Table 4.2.2, which are based on combined emissions from the proposed facility and from regional sources.

The modeled concentrations, when including regional sources, are much higher (by a factor of 3 or more) and the locations of the maximum concentrations are farther from the proposed facility and in different directions from those produced by modeling only emissions from the proposed facility.

The maximum modeled pollutant concentrations were added to monitored background concentrations (from Table 3.2.1) to obtain estimates of cumulative impacts for comparison with NAAQS (Table 4.2.2). This procedure is conservative because any effects of the regional modeled sources, which would also be included in the monitored background data, would be double-counted. The 24 hour averaged $PM_{10}$ concentration estimated by this procedure was 94% of the NAAQS; concentrations of $SO_2$ and $NO_2$ were less than 50% of their respective NAAQS, and the annual concentration of $PM_{10}$ was less than 75% of the NAAQS. As indicated from the PSD analysis, and as shown in Table 4.2.1, the highest modeled concentration increases of $PM_{10}$ from the proposed power plant (i.e., 2 $\mu g/m^3$ for 24 hour $PM_{10}$) would be more than a factor of 10 below the modeled concentrations from other sources in the region. Thus, the proposed power plant would be an extremely small contributor to ambient air $PM_{10}$ concentrations.

**Table 4.2.2. National Ambient Air Quality Standards (NAAQS) impact analysis for combined effects of regional sources and the proposed power plant**

| Pollutant[a] | Averaging period | NAAQS[b] | Modeled concentration[c] and location | Modeled Impact | Ambient background concentration[d] | Total Impact | |
|---|---|---|---|---|---|---|---|
| | | (μg/m³) | (μg/m³) | % NAAQS | (μg/m³) | (μg/m³)[e] | % NAAQS |
| $SO_2$ | 3-hour | 1,300 | 267; 1.8 mi NNW | 20 | 165 | 432 | 33 |
| | 24-hour | 365 | 100; 4.4 mi NW | 27 | 71 | 171 | 47 |
| | Annual | 80 | 17; 1.4 mi WNW | 21 | 13 | 30 | 38 |
| $NO_2$ | Annual | 100 | 5; 3.2 mi WNW | 5 | 36 | 41 | 41 |
| $PM_{10}$ | 24-hour | 150 | 60; 4.0 mi SW | 40 | 81 | 141 | 94 |
| | Annual | 50 | 11; 0.9 mi NNE | 22 | 26 | 37 | 74 |

[a]The chemical symbols for the pollutants are as follows: $SO_2$ = sulfur dioxide; $NO_2$ = nitrogen dioxide; $PM_{10}$ = particulate matter less than 10 μm in diameter.
[b]NAAQS are established under the Clean Air Act to protect public health and welfare with an adequate margin of safety.
[c]Maximum modeled concentration from existing regional sources plus the proposed power plant, except that the 24 hour $PM_{10}$ concentration is the 3-year average of each year's third highest concentration, which corresponds with the standard.
[d]From Table 3.2.1.
[e]The sum of the modeled concentration and the ambient background concentration.

In addition, the conservative analysis procedure used to model particulate (and other criteria pollutant) concentrations results in air quality impact values that substantially over-estimate the values that would actually be expected from the proposed power plant. Thus, no exceedances of any NAAQS would be expected to be produced by the power plant at any location where a member of the general public would be likely to be exposed. Because the modeled concentrations are substantially below the NAAQS, emissions of $SO_2$, $NO_2$, and $PM_{10}$ would not be expected to result in any adverse effects on human health and welfare.

#### *4.2.2.2 Ozone Formation*

Ozone ($O_3$) is a pollutant of concern because existing background levels in the ambient air are close to the NAAQS (Table 3.2.1). Ozone is a secondary pollutant formed from *photochemical* reactions involving emissions of $NO_x$ and volatile organic compounds (VOCs). The reactions involved can take hours to complete; thus, $O_3$ can be formed far from the sources of the precursor pollutants that initiate its formation. Therefore, the contribution of any particular source to regional $O_3$ concentrations cannot be readily quantified.

Table 4.2.3 compares projected annual emissions of $NO_x$ and VOCs from the proposed power plant with 1999 emissions from Sangamon and Logan counties. The proposed plant would increase annual $NO_x$ emissions by an estimated 548 tons, or about 2% of the total emissions from existing sources in the two-county area. Estimated annual VOC emissions from the proposed plant would be 127 tons, or about 1% of existing emissions from sources in the two-county area. Because $O_3$ near Elkhart is likely to be influenced by pollutants emitted from a region larger than only those two counties, the above estimates of the percentage increases of $NO_x$ and VOCs from the proposed power plant, which could affect $O_3$ near Elkhart, are likely to be upper-bound estimates.

The higher of the two percentage increases (2%) calculated for $O_3$ results from $NO_x$ emissions. The 2% increase in annual $NO_x$ emissions was calculated by integrating the maximum hourly $NO_x$ emission level of 125 lb from the power plant over an entire year. Assuming $NO_x$ emissions from other sources in the two-county area are produced continuously at a steady rate over a year, the maximum hourly emission level from the proposed power plant would represent a 2% increase. The impact on hourly $O_3$ formation from photochemical reactions involving $NO_x$ would be expected to vary with the hourly $NO_x$ levels.

Assuming, as a rough estimate, that the 2% increase in $NO_x$ results in a 2% increase in $O_3$ concentration, the 1 hour ambient $O_3$ concentration of 196 $\mu g/m^3$ (Table 3.2.1) would be expected to increase to 200 $\mu g/m^3$, which is still well below the NAAQS of 235 $\mu g/m^3$. Although this 4 $\mu g/m^3$ increase in ambient $O_3$ concentration is based on an assumed linear relationship between $NO_x$ emissions and $O_3$ level, the small contribution of $NO_x$ emissions from the proposed power plant to ambient $NO_x$ levels would be extremely unlikely to cause any exceedance of the 1 hour NAAQS for $O_3$. Sufficient data are not yet available to evaluate the effects of the proposed project in terms of the new 8 hour $O_3$ standard.

**Table 4.2.3. Emissions of ozone precursors from the proposed power plant compared with emissions from Logan and Sangamon Counties in 1999**

| Pollutant | Proposed power plant (tons/year) | Sangamon County (tons/year) | Logan County (tons/year) | Total Two-County emissions (tons/year) | Power plant emissions (% of Two-County Total) |
|---|---|---|---|---|---|
| $NO_x$ | 548 | 21,879 | 4,976 | 26,855 | 2 |
| VOCs | 127 | 9,748 | 2,581 | 12,329 | 1 |

*Source*: Illinois emissions obtained from the U.S. Environmental Protection Agency (2002).

#### *4.2.2.3 Acidic Deposition*

Acidic deposition, which is more commonly known as *acid rain*, occurs when $SO_2$ and $NO_x$ are chemically transformed and transported in the atmosphere and deposited on the earth's surface in the form of wet (rain, snow, fog) or dry (particle, gas) chemical agents. The $SO_2$ and $NO_x$ are readily oxidized in the atmosphere to form sulfates and nitrates. Subsequently, the sulfates and nitrates may form sulfuric acid and nitric acid when combined with water, unless neutralized by other chemicals. Deposition of these acids over time may contribute to the acidification of lakes and subsequent damage to aquatic systems. Forests and agricultural areas are also potentially vulnerable because acidic deposition can cause leaching of nutrients from soils, inhibit microorganisms that convert atmospheric nitrogen into fertilizers for plants, and contribute to the release of toxic metals (EPA 1988). Acidic deposition also contributes to the corrosion of metals and deterioration of stone in buildings, statues, and other cultural resources. Sulfate particles and $NO_x$ also reduce visibility by interfering with light transmission in the atmosphere.

$SO_2$ and $NO_x$ can be transported by wind for hundreds of miles from one region to another before deposition onto earth in the form of acid rain. Therefore, the air mass moving over any given area will contain both residual emissions from sources in distant areas and emissions from sources in areas over which the air mass has more recently passed. This continuing depletion and replenishment of emissions along the flow path of an air mass results in uncertain relationships between specific sources of emissions and acid deposition at any particular location.

Projected annual increases in $SO_2$ and $NO_x$ emissions from the proposed power plant are estimated to be 1,042 tons and 548 tons, respectively (Table 4.2.4). Whether a ton of $SO_2$ or a ton of $NO_x$ is more damaging depends on several factors, including the nature of the resource being impacted and the time scale under consideration. In general, however, no clear basis exists to consider either $SO_2$ or $NO_x$ as a more damaging precursor of acidic deposition than the other on a ton-for-ton basis.

Table 4.2.4 compares projected annual emissions of $SO_2$ and $NO_x$ from the proposed power plant with 1999 emissions from the State of Illinois (EPA 2002), which was chosen as an appropriate area to represent emissions affecting acidic deposition. Table 4.2.4 shows that estimated emissions of $SO_2$ and $NO_x$ from the proposed power plant represent one-tenth of one percent or less of existing emissions from the State of Illinois. Thus, the expected contribution of emissions from the proposed power plant to acidic deposition would be negligible.

**Table 4.2.4. Emissions of acid-rain precursors from the proposed power plant compared with emissions from the State of Illinois in 1999**

| Pollutant | Proposed power plant (tons/year) | Illinois (tons/year) | Power plant emissions (% of Illinois emissions) |
|---|---|---|---|
| $SO_2$ | 1,042 | 1,055,000 | 0.10 |
| $NO_x$ | 548 | 1,112,000 | 0.05 |

*Source*: Illinois emissions obtained from the U.S. Environmental Protection Agency (2002).

In addition, Elkhart Hill, which is located approximately 1 mile northwest of the proposed power plant site and which has a maximum elevation of about 200 ft above the plant site, would be considered to be in the near field relative to emissions from the power plant. The atmospheric reactions necessary to create sulfuric acid and nitric acid take time and are not near-field phenomena. Because the proposed plant would be relatively close to Elkhart Hill, emissions of $SO_2$ and $NO_x$ from the plant would not be expected to undergo the level of atmospheric transformation and deposition required for their confining air mass to affect Elkhart Hill.

#### *4.2.2.4 Global Climatic Change*

The combustion of fossil fuels has contributed to an increased atmospheric concentration of $CO_2$ over the last century. Because $CO_2$ contributes to the earth's greenhouse effect, the increased $CO_2$ concentration may have contributed to a corresponding increase in globally averaged temperature in the lower atmosphere (IPCC 1992). However, because $CO_2$ is stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact does not depend on the geographic locations of sources. Therefore, $CO_2$ emissions from a specific combustion source only effective in altering atmospheric $CO_2$ concentrations to the extent that they proportionally contribute to the total quantity of fossil fuel combustion emissions that increase global $CO_2$ concentrations. A corresponding increase in atmospheric sulfate loading from fossil-fuel combustion may also act to reduce global-scale warming by increasing the reflection of incoming solar radiation (Mitchell et al. 1995).

The proposed power plant would increase global $CO_2$ emissions by about 911,000 tons per year, which represents about 0.003% of the current annual global $CO_2$ emissions from fossil fuel combustion (Table 4.2.5). The proposed plant would also increase $SO_2$ emissions by an estimated 1,042 tons per year. Assuming $SO_2$ emissions are proportional to atmospheric sulfate loadings, and global anthropogenic $SO_2$ emissions are about 145 million tons per year (Hameed and Dignon 1992, Graedel and Crutzen 1993), the proposed plant would increase global anthropogenic sulfate loadings by about 0.0007%. The added atmospheric sulfate would act to decrease the amount of solar radiation available for heating the lower atmosphere and thus tend to offset $CO_2$-induced warming, although a quantified and accurate estimate of the amount of offset cannot be provided based on the current state of knowledge. In any case, although the $CO_2$ emission rate from the proposed power plant would be large, relative to the global environment the expected contribution of emissions from the proposed power plant to global climate change would be negligible.

**Table 4.2.5. Comparison of $CO_2$ emissions from the proposed power plant with U.S. and global $CO_2$ emissions from fossil fuel combustion**

| Power plant (tons/year) | U.S. (tons/year) | $CO_2$ emissions (% of U.S. emissions) | Global (tons/year) | $CO_2$ emissions (% of global emissions) |
|---|---|---|---|---|
| 911,000 | 6,007,667,000 | 0.015 | 26,100,000,000 | 0.003 |

*Source*: U.S. and global $CO_2$ emissions obtained from Marland et al. (2002) and converted to tons of $CO_2$ per year. Emissions from combustion of coal, oil, and natural gas and from gas flaring are included.

#### *4.2.2.5 Conformity Review*

Section 176(c) of the Clean Air Act requires that Federal actions conform to State Implementation Plans (SIPs) developed for attainment of National Ambient Air Quality Standards, and a rule ("Determining Conformity of General Federal Actions to State or Federal Implementation Plans") for implementing the requirement was promulgated by EPA on November 30, 1993 (58 *FR* 63214). The rule establishes the criteria and procedures necessary to ensure that Federal actions conform to the applicable SIP and comply with provisions of the Clean Air Act. The rule requires that all emissions of criteria air pollutants and volatile organic compounds (1) are identified and accounted for in the SIP and (2) conform to a SIP's purposes of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards and of achieving expeditious attainment of such standards. Actions in a non-attainment area or a maintenance area are affected by the provisions of the conformity rule. The proposed plant would be located within an attainment area; thus, the provisions of the conformity rule would not apply and a conformity determination would not be required.

### *4.2.2.6 Hazardous Air Pollutants*

Federal Regulations

On December 20, 2000, the U.S. Environmental Protection Agency (EPA) published a notice in the *Federal Register* announcing EPA's Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units (65 *FR* 79825). EPA's finding was that regulation of hazardous air pollutant emissions from coal- and oil-fired electric utility steam generating units under Section 112 of the Clean Air Act was appropriate and necessary. EPA also reiterated an announcement from a 1998 Report to Congress that, for the utility industry, mercury from coal-fired electric utility steam generating units was the hazardous air pollutant of greatest concern for public health. Electric utility steam generating units produce the largest quantity of human-caused mercury emissions in the United States, releasing about 48 tons (or about 40% of the total U.S. emissions) of mercury into the air each year.

EPA's determination in December 2000 required a proposed regulation by December 2003 and a final rule by December 2004. Currently, EPA is considering a regulatory approach that would cap mercury emissions from coal-fired power plants at 34 tons-per-year by 2010. The cap would be further reduced to 15 tons-per-year by 2018. Emissions sources would be assigned an allowance to emit mercury, and utilities would be permitted to purchase or sell allowances and adjust their emissions accordingly. EPA may also consider an alternative approach for controlling mercury emissions based on application of the Maximum Achievable Control Technology (MACT) rule of Section 112 of the Clean Air Act. Under the MACT rule, regulations would be based on mercury emissions as measured at the best performing plants, and installation of control technology that could achieve those low emission levels at each specific plant would be required by the end of 2007.

Combustion Emissions of Hazardous and Other Air Pollutants

Many chemical species can be emitted in trace quantities during the combustion of coal. These species would include materials from the list of 188 hazardous air pollutants identified under Title III of the 1990 Clean Air Act Amendments. The characteristics and amounts of emissions would depend on combustion temperature, fuel feed mechanism, the composition of the fuel, and the performance characteristics of systems used for controlling emissions. Temperature determines the degree of volatilization of specific compounds contained in the fuel. The fuel feed mechanism affects the partitioning of emissions into bottom ash and fly ash. Trace metal emissions also depend on the concentration of the metal in the fuel, the combustion conditions, the type of particulate control device used, and the physical and chemical properties of the metal.

As indicated in Section 2.1.7.1, the proposed plant would emit a small amount of volatile organic compounds and trace quantities of other (non-criteria) pollutants, such as mercury, beryllium, arsenic, various heavy metals, and hydrochloric acid (hydrogen chloride). The following discussion provides an overview of the formation and significance of such species during coal combustion processes.

Organic compound species produced during combustion include volatile organic compounds that remain in a gaseous state in ambient air, semi-volatile organic compounds, and condensable organic compounds. Volatile organic compounds are defined as any organic compounds that participate in atmospheric photochemical reactions. Hydrocarbon emissions from combustion sources are primarily aliphatic, oxygenated, and low molecular weight aromatic compounds that exist in the vapor phase at flue gas temperatures. Included are emissions of alkanes, alkenes, aldehydes, carboxylic acids, and substituted benzenes. Organic compounds emitted in a condensed phase typically consist of polycyclic organic matter (POM) and polynuclear aromatic hydrocarbons (PAH). Polycyclic organic matter can be especially prevalent in the emissions from coal burning, because a large fraction of the volatile matter in coal exists as POM.

Pursuant to directions issued to EPA by Congress in Section 112 of the Clean Air Act, EPA prepared a Report to Congress covering an extensive Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units (EPA 1998). The study included initial collection of HAP emissions test data from 52 utility units, including a range of coal, oil, and gas fired units, and the test data were used to estimate HAP emissions from all 684 utility plants in the United States. Although not specific to the proposed plant, the EPA information provides an indicator of the potential impacts to be expected from the proposed plant. Of the 188 HAPs listed in Section 112 of the Clean Air Act, a total of 67 HAPs were identified in the emissions testing program as potentially being emitted by utilities. Twelve pollutants (arsenic, beryllium, cadmium, chromium, manganese, nickel, hydrogen chloride (HCl), hydrogen fluoride (HF), acrolein, dioxins, formaldehyde, and radionuclides) were identified as priority pollutants for further study based on potential for inhalation exposures and risks. Two additional pollutants (mercury and lead), in addition to arsenic, cadmium, dioxins, and radionuclides, were identified as priority for multi-pathway exposure.

EPA reports that, although polychlorinated biphenyl (PCB) formation is thermodynamically possible from combustion of fuels containing some chlorine, formation of PCBs during combustion is unlikely due to short combustion residence times at conditions favoring PCBs and to low chlorine concentrations. Dioxins (heterocyclic, chlorinated hydrocarbons) and furans (heterocyclic $C_4H_4O$ compounds) can form from high-temperature combustion of fuels containing organic, chloride, and fluoride compounds. However, with efficient mixing, oxygen availability, and adequate residence time at typical combustion temperature (e.g., 800 – 1,000°C), which would be representative of the LEBS plant, PCBs, polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) may be efficiently destroyed. EPA reported from their studies of emissions from utilities that dioxins were not detected in over 40% of their measurements, and EPA's estimate was that coal-fired utilities emit 0.2 lb/year of dioxin. Chlorinated polynuclear aromatic compounds (PNAs) can be formed by catalyzed reactions on fly ash particles at low temperatures in equipment downstream from the combustion chamber.

Formaldehyde ($H_2CO$) can be formed and emitted during the combustion of coal and would be present in the resulting flue gases in the vapor phase. Because formaldehyde is subject to oxidation and decomposition at the high temperatures encountered during combustion, large units with efficient combustion, closely regulated air-fuel ratios, uniformly high combustion chamber temperatures, and relatively long retention times should have lower formaldehyde emissions rates than do small, less efficient combustion units.

Mercury emissions from coal combustion, which are the primary focus for regulation by EPA as a hazardous air pollutant, may exist in three different forms elemental mercury, divalent oxidized mercury, and mercury adsorbed onto fly ash or other particles. Information collected by EPA from emission tests on 84 generating plants representing different plant configurations and coal ranks indicated that mercury speciation at the furnace exit was principally influenced by chlorine content of coal and temperature, with about 75-90% of the mercury reported to be adsorbed on particles or existing as divalent oxidized mercury for coals with chloride contents greater than 150-200 ppm.

Hazardous Air Pollutant Emissions Estimates

Emission factors are commonly used to establish emission inventories in the absence of directly measured emissions. Emission factors have been compiled by EPA (EPA 42) for hazardous materials from combustion operations representing those proposed for the LEBS plant – that is, for combustion of bituminous coal in a pulverized coal-fired system that uses a wet bottom boiler and that is equipped with emissions control devices consisting of an electrostatic precipitator and a wet scrubber. The proposed plant would combust Illinois bituminous coal in a slagging combustor and would use both an electrostatic precipitator and a wet limestone scrubber for emissions control.

Table 4.2.6 presents EPA's reported emission factors of various HAPs in lb/MM Btu from combustion of bituminous coal. In addition, trace metal characterization information developed by the Illinois State Geological Survey (ISGS) for coals mined in Illinois (ISGS 2003) were reviewed, and results are provided in the table for comparison with the emission factor information reported by EPA. For arsenic, beryllium, chromium, manganese, nickel, and hydrogen fluoride, the concentrations based on analysis of Illinois coal are comparable to the uncontrolled emission factor values reported by EPA. For both mercury and cadmium, the concentrations based on analysis of Illinois coal are about 50% lower than the values reported by EPA for uncontrolled emissions, while the coal analyses for lead and fluoride are 3 to 4 times higher than the uncontrolled emission factor values reported by EPA.

Based on the coal feed rate of 47 tons per hour for the proposed plant and the coal heating value of 10,450 Btu/lb, the table also presents both the rate of trace material feed to the plant in lb/hour using the ISGS analyses for Illinois coals and the rate of uncontrolled emissions from the plant in lb/hour based on the EPA emissions factors. EPA has also compiled information on the average trace material (i.e., arsenic, beryllium, cadmium, chromium, manganese, nickel, selenium, and POM) removal efficiencies using various control devices, including electrostatic precipitators and wet scrubbers, which would both be used in the proposed plant. For these trace materials, the table also presents the estimated rates of hazardous air pollutant emissions that would be anticipated following the flue gas cleanup control devices.

**Table 4.2.6. Estimated combustion HAP emission rates for selected trace materials**

| MATERIAL | EPA EMISSION FACTOR[1] | ILLINOIS COAL | | UNCONTROLLED EMISSION RATE BASED ON EMISSION FACTORS | CONTROLLED EMISSION RATE |
|---|---|---|---|---|---|
| | | CONTENT | FEED RATE | | |
| | (lb/MM Btu) | (lb/MM Btu) | (lb/hour) | (lb/hour) | (lb/hour) |
| | | | | | |
| Arsenic | 0.000538 | 0.00059 | 0.58 | 0.528 | 0.0058[3] |
| Beryllium | 0.000081 | 0.00009 | 0.093 | 0.08 | 0.0046[4] |
| Cadmium | 0.00007 | 0.000039 | 0.039 | 0.069 | 0.0039[5] |
| Chromium | 0.00157 | 0.001 | 1.086 | 1.54 | 0.109[6] |
| HCl | 0.057 | 0.13[9] | 129.6[9] | 56.0 | |
| HF | 0.007 | 0.0073[10] | 7.2[10] | 6.88 | |
| Lead | 0.000507 | 0.0019 | 1.86 | 0.5 | |
| Manganese | 0.00298 | 0.003 | 2.95 | 2.9 | 0.067[7] |
| Mercury | 0.000016 | 0.0000071 | 0.007 | 0.016 | |
| Nickel | 0.00129 | 0.001 | 1.08 | 1.27 | 0.036[8] |
| POM | 0.00000889[2] | | | | 0.009[2] |
| Selenium | 0.00002434[2] | 0.00015 | 0.147 | | 0.024[2] |

(1) Uncontrolled value, unless otherwise indicated.
(2) Controlled value reported by EPA, based on electrostatic precipitator.
(3) Based on EPA-reported control efficiency of 98.9% using an electrostatic precipitator and scrubber.
(4) Based on EPA-reported control efficiency of 94.3% using a FGD scrubber.
(5) Based on EPA-reported control efficiency of 94.4% using a FGD scrubber.
(6) Based on EPA-reported control efficiency of 92.9% using an electrostatic precipitator and scrubber.
(7) Based on EPA-reported control efficiency of 97.7% using an electrostatic precipitator and scrubber.
(8) Based on EPA-reported control efficiency of 97.2% using an electrostatic precipitator and scrubber.
(9) Chloride content.
(10) Fluoride content.

Based on the uncontrolled emissions rates, under existing regulations the proposed plant would be considered a major source of hazardous air pollutants. Thus, the proposed plant would be subjected to review under Section 112(g) of the Clean Air Act.

Hazardous Air Pollutant Emissions Control

Particulate control technologies provide the capability to reduce hazardous air pollutants, particularly metals that would be vaporized in the combustion process but condensed onto solid flyash particles in the exhaust gas. The efficiency for removal of solid particles may not, however, correspond to the removal efficiencies for specific hazardous air pollutants or metals, due to the possibilities for enrichment of the metals on fine-sized particles. This phenomenon may be important for metals that volatilize at peak combustion temperature and condense as (or on) particulate at flue gas temperatures.

Mercury capture in control technologies depends on the relative amounts of the different possible mercury species present in flue gas. Mercury bound to particles can easily be removed in conventional particulate emission control devices such as electrostatic precipitators, which are generally effective in removing greater than 90% of all trace metallic hazardous air pollutants except for gas-phase pollutants, which include trace organic compounds, hydrogen chloride, and hydrogen fluoride. Divalent oxidized mercury is generally soluble in water and can be captured in wet scrubbers. Wet flue gas desulfurization systems are capable of capturing nearly all hazardous air pollutants other than elemental mercury and can generally capture more than 90% of divalent and particle-bound mercury. Elemental mercury is not soluble in water, does not react with reagents used in flue gas desulfurization systems, and is not captured in wet scrubbers. However, bituminous coals contain higher concentrations of chlorine and other constituents that promote oxidation and capture of mercury in conventional air pollution control devices. From Table 2.1.2, the chlorine content of Turris Mine coal is about 1,000 ppm; based on EPA's reported emission testing data, this chlorine concentration would promote divalent or particle-bound forms of mercury, which would be amenable to 75-90% removal in the electrostatic precipitator or wet scrubber planned for the proposed plant. At these levels of mercury control, EPA's emission factor for mercury would be reduced to 0.00004 lb/MM Btu to 0.0000016 lb/MM Btu, and the calculated rate of emissions from the plant would be 0.004 lb/hr to 0.0016 lb/hr (14 to 35 lb/year).

Based on reviews performed by the Illinois EPA, the Low Emissions Boiler System plant as proposed with both an electrostatic precipitator and a wet scrubber was determined to use Maximum Achievable Control Technology (MACT) technologies for emissions of hazardous air pollutants, as required by Section 112(g) of the Clean Air Act. The Illinois EPA also determined that the proposed plant would comply with Section 112(g) of the Clean Air Act and applicable National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR 63, Subpart B).

<u>Permit compliance</u>

The permit issued by the Illinois EPA for the proposed plant (Appendix D) requires emissions testing subsequent to startup of the plant. Testing is required for mercury, arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, hydrogen chloride, hydrogen fluoride, and dioxin and furan. Mercury identified in emissions from the plant must be characterized to determine the form of mercury in the emissions (i.e., bound to solid particles, as oxidized mercury, or as elemental mercury). Dioxin and furan measurements are required for a 3-year period.

For controlling mercury emissions, the Illinois EPA established a requirement for the proposed plant to achieve one of the following standards:

- An emission rate of 0.000004 lb/MM Btu, or emissions below the detection limit of established measurement technology, as demonstrated by periodic testing;

- A removal efficiency of 90% without injection of agents specifically used to control mercury emissions, as demonstrated by periodic testing;
- Injection of agents specifically used to control mercury emissions in a manner to achieve maximum practicable degree of removal, as demonstrated by proper equipment operation;
- Mercury control levels established by a revised PSD permit pursuant to Section 112(g) of the Clean Air Act, if required due to engineering limitations in meeting the above standards, as demonstrated by proper equipment operation; or
- The mercury emission control requirement established by the U.S. EPA pursuant to Section 112(d) of the Clean Air Act, upon adoption of a final mercury rule.

The Illinois EPA also established a mercury emission limit of 0.02 tons (40 lb) per year, or an hourly equivalent of 0.0046 lb based on plant operation at full capacity and 100% availability. Coal supplies to the proposed plant must also be analyzed for mercury and other metals and chlorine content.

Health and Ecological Effects

EPA developed inhalation exposure and cancer risk information from dispersion modeling of HAPs emissions from all 684 power plants included in the EPA study. For all but two of the 426 coal-fired plants that were studied, the lifetime cancer risks to the local (within about 30 miles) population due to inhalation exposure to HAPs emissions were less than one in a million. For the two plants with greatest risk, the local increase in lifetime cancer risk was a maximum of two in a million. EPA also analyzed noncancer risks due to inhalation of HAPs emissions. The highest estimated long-term HAP concentrations in the ambient air were found to be 10 to 10,000 times below the daily inhalation reference concentrations for exposures deemed likely to result in appreciable risk of deleterious effect during a lifetime, including lifetimes of sensitive groups.

Mercury is a highly toxic and persistent species that can bioaccumulate in the food chain. Atmospheric emissions of mercury eventually deposit onto land or water bodies, and deposition can occur near the emission source or at distant locations. Air transport and deposition patterns of mercury depend on factors that include the form in which mercury is released (e.g., elemental mercury typically deposits farther from the source), the stack height, temperature of the exhaust gas, meteorological conditions, and chemical transformations during atmospheric transport. Deposits of mercury can be transformed into methyl mercury, which is a more toxic form of mercury that accumulates in aquatic species (e.g., fish). Human and wildlife are mainly exposed to mercury by consumption of fish and other kinds of seafood containing elevated levels of mercury. Neurotoxicity is the predominant concern from exposure to methyl mercury, which has a half-life in the human body of about 75 days. Ingested methyl mercury is almost completely absorbed into the blood and distributed to all tissues, including the brain and through the placenta of pregnant women to the fetus and fetal brain. Because a developing fetus is most sensitive to the effects of methyl mercury, the greatest health concern for humans is the consumption of mercury-contaminated fish by women of childbearing age. Offspring born of women exposed to high levels of methyl mercury during pregnancy exhibit a variety of developmental neurological abnormalities, including delayed development, cerebral palsy, and reduced scores on neurological tests.

EPA evaluated exposures, hazards, and risks due to hazardous air pollutant emissions from coal-fired electric utility steam generating units, considering both inhalation and ingestion exposure pathways, for six hazardous air pollutants: mercury, radionuclides, arsenic, cadmium, lead, and dioxins. EPA concluded that for arsenic and cadmium (and other metals, including nickel and chromium) a potential concern exists for carcinogenic effects, although the cancer risks are not high. Inhalation exposure to inorganic arsenic is associated with lung cancer, and ingestion produces increased risks of skin, bladder, lung, and liver cancers. Ingestion of large amounts of chromium can cause stomach ulcers and kidney and liver damage, and inhalation can produce lung irritation, bronchitis, pneumonia, asthma, or other respiratory illnesses. The chances of developing cancer as a result of a person's life-long exposure to chromium emissions from a coal-fired power plant were estimated by EPA as one (or less) in a million. Exposures to small quantities of nickel over long time periods can result in allergic reactions, particularly itching of the skin. Ingestion of nickel can produce vomiting and diarrhea, and inhalation can produce asthma. EPA has determined that the cancer risk from nickel emissions from coal-fired plants would be less than one chance in a million for a person with life-long exposure to coal-fired power plant emissions.

Dioxins (along with hydrogen chloride and hydrogen fluoride) were identified as hazardous air pollutants of potential concern. Hydrogen chloride and hydrogen fluoride vapors can irritate the lungs and cause bronchitis and may cause skin rash, irritation, and eye damage. Neither hydrogen chloride nor hydrogen fluoride has been found to cause cancer. EPA evaluated exposures to hydrogen chloride at power plants and determined that emissions do not pose a significant health risk. The amount of hydrogen fluoride released to the atmosphere from power plants was determined by EPA to never reach unhealthy levels. Information on the human health effects of dioxins was limited but suggested an increased risk for cancer from dioxin exposure. Dioxin exposures may also result in skin rashes, vomiting, fever, and abdominal pain.

EPA found that the remaining hazardous air pollutants (i.e., radionuclides and lead) from coal-fired plants did not appear to be concerns for public health. EPA determined that exposures to radionuclides from utilities were substantially lower than the risks due to natural background radiation. Ingestion of large quantities of manganese can harm the human brain, and inhalation of large quantities of manganese dust can irritate the lungs, cause impotence, and cause mental confusion and clumsy body movement. Manganese has not been found to cause cancer in humans, and evaluations by EPA indicate that manganese exposures for humans living near power plants would never exceed 5% of the safe exposure level for inhalation.

For the proposed project, trace emissions of hazardous air pollutants and other non-criteria pollutants would not be expected to result in adverse impacts on the health of workers, members of the public, or ecological resources.

## 4.3 WATER RESOURCES

### 4.3.1 Construction

During the construction period, the contractor(s) selected for erecting the proposed power plant would be responsible for providing potable water from off-site sources until the proposed new wells (Section 2.1.6.2) and water treating equipment have been installed, tested, and certified to supply an acceptable source of water. The construction contractor(s) would supply temporary equipment for fire protection of the construction site until more permanent sources of fire protection water from the Turris Mine or the new water wells would be available. The field drainage runoff and well water systems would be used to provide water for construction activities that would not require potable water. The Fresh Water Pond at the Turris Mine would also be available for providing non-potable water.

Water uses during construction would include rinsing of equipment and structures, preparation of mixtures such as concrete, and dust suppression. Water for dust suppression would be applied to site roads and construction areas only when required by site conditions. Water usage for such purposes during dry periods would be expected to total 8,000 gpd and would be obtained from groundwater wells. During power plant construction, the installed new piping would be flushed with a good quality, de-ionized water; the volume of water used would amount to several times the volume of the piping systems. The new boiler would also be filled and flushed with water several times. The boiler would subsequently be pressure tested at progressively higher pressures, until achieving successful check-out at 150% of the rated operating pressure of the boiler. Neither retention pond water nor well water would be expected to be available for use in preparing concrete, etc., during the early part of the construction effort. Water from the Turris Mine's process water system would be available to extinguish any accidental fires and to provide water for dust suppression during construction.

During plant construction, portable sanitary facilities would be provided to minimize requirements for additional sanitary water. The existing and proposed new sanitary facilities would only be used by authorized, existing employees. Construction contractor(s) would need to provide temporary facilities for construction workers. The relatively short duration and size of the project as well as the intermittent use and consumption of water during construction would not cause the existing water sources to be overdrawn.

All construction would be performed in accordance with an erosion and sedimentation control plan. Standard engineering practices, such as use of straw berms, installation of liners, application of cover materials, and grading, would be implemented as required to minimize runoff, erosion, and sedimentation near the site. Impacts attributable to construction-related runoff, erosion, and sedimentation would be minimal.

Accidental spills of construction materials, such as solvents, paint, caulk, oil, and grease, that could contain hazardous substances would be cleaned in a timely manner and in accordance with a spill prevention, control, and countermeasures plan. Runoff of accidental spills into the Lake Fork Creek watershed would be minimized. A stormwater pollution prevention plan and an installation spill plan would be developed for the proposed plant. These plans would provide specific measures for spill prevention, such as secondary containment for tanks.

### 4.3.2 Operation

During normal operations, the only water to be discharged directly from the proposed power plant would be an additional 3 gpm (conservative value) through the existing sewage treatment facility operated at the Turris Mine and 62 gpm of cooling tower blowdown to the Turris Mine's fresh water pond, which is used to provide water for coal washing.

The new sanitary discharge of 3 gpm would be piped to the existing treatment facility at the Turris Mine and combined with sanitary waste produced at the mining and coal processing complex. The added waste would have minimal effect on the existing treatment system, which was designed to handle 200 employees, but which is operating in support of a considerably smaller staff. The 3 gpm estimate for added sanitary discharge is a conservative value. The proposed plant would be expected to host a maximum of 30 employees and visitors per day. Based on a person's normal usage of about 50 gallons of water per day for drinking and sanitary purposes, only about 1,500 gallons per day (approximately 1 gpm) of water may be required.

Approximately 98 gpm of water would be associated with slag waste, water conditioning sludge, and FGD gypsum waste. While these materials could potentially be marketed, off-site disposal may be required. All other water used in the power plant (1,032 gpm), in addition to water for sewage treatment water, cooling tower blowdown, and waste handling, would be released through either evaporation or cooling tower drift.

The total water demand for the plant (1,195 gpm, or 1.7MM gpd) would be serviced by the development of a field tile drainage system and retention pond, with additional water supplies available from groundwater wells. Water demand for the plant would primarily be provided from the field drainage system during normal operations. During off-normal conditions, such as dry periods, drought, or extreme cold, when the field drainage system and retention pond would not be capable of meeting the water demand for the plant, groundwater from the well field that would be developed as part of the proposed project would supply the additional water required for operations.

The maximum measured flow in the field tile drainage system, which fluctuates seasonally, is 2 MM gpd. The water holding capacity of the retention pond (approximately 107.5 MM gallons) would support about 60 days of power plant operation without additional inflow. A groundwater study (Farnsworth Group 2001) within the plant area indicated that a 2 MM gpd sustainable water supply could be obtained using a multiple well system of properly spaced and managed wells. Groundwater could, therefore, provide a supplemental source of water for the proposed power plant during times of low surface water availability from the field tile drainage system and the retention pond.

The primary water source for the groundwater wells would be water stored within aquifers. The locations for up to 6 new groundwater supply wells would be based on data developed from an extensive groundwater survey conducted to identify sources of water that would minimize effects on adjacent wells and on nearby wells that serve the Turris Mine and the village of Elkhart. Figure 3.4.5

identifies the locations of 11 groundwater supply test wells included in the survey. The groundwater survey data indicated that aquifers have substantial capacity and would be capable of providing the proposed power plant with water sufficient to endure up to 3 months of drought. In the event of an extreme drought, the proposed plant may need to reduce operations to preserve the municipal water supply.

The initially estimated water requirement for the power plant was 1,400 gpm (about 2 MM gpd). To achieve this water flow, a new well field that included a well in relatively close proximity to the village of Elkhart's well was considered to be necessary. However, based on current power plant design considerations, a reduced water requirement (1,195 gpm) would be needed, and expectations are that the reduced water requirement could be satisfied from other wells within the new well field. On this basis, development of a well in close proximity to the Elkhart municipal well may not be required. Current plans would result in development of this well only if absolutely necessary to meet water requirements.

Of the wells studied as candidates for development to support the power plant's water requirements, well (TH1-01) was closest (within 1,300 ft) to the village of Elkhart's municipal well. Pumping tests performed on well TH1-01 by the Farnsworth Group (2001), which resulted in an estimated sustained yield of 250 gpm, indicated a drawdown estimated at 70.6 ft from a total available drawdown of 79.6 ft. The estimated transmissivity for the aquifer in the vicinity of well TH1-01 was approximately 2,500 gpd/ft. Potential interference between well TH1-01 and the Elkhart municipal well, if well TH1-01 should be used, could result in excessive drawdown at the municipal well. If well TH1-01 is used and results in an excessive drawdown at the municipal well, increased operating expenses for the village well could result, and the yield from the village well could be reduced. The possibility of interference was investigated using the results from a pumping test by Kohlhase and Lott (2001). Considering steady-state operation of well TH1-01 under *leaky artesian conditions*, Kohlhase and Lott analyzed the data for well TH1-01 and the village of Elkhart's municipal well and determined that the potential interference between the two wells would result in a long-term impact of 6 ft of additional drawdown at the Elkhart municipal well, which would not be significant to operation of the municipal well. The estimated interference of 6 ft is supported by the results from the pumping test of well TH1-01, which was conducted over a period of 72 hours at a pumping rate of 230 gpm. During the test, the water level at Elkhart's municipal well was measured, and the maximum drawdown was 4 ft.

The other wells considered for development as part of the project would be east of the power plant site, approximately 12,000 ft from Elkhart's municipal well. Pumping tests on two of these wells (TH5-01 and TH9-01) resulted in estimated sustained yields of 470 gpm and 525 gpm, respectively. In analyzing results from the pumping tests, potential interference between wells TH5-01 and TH9-01 and an additional well at an equal distance from TH9-01 was considered. Potential interference was estimated to be 7.0 ft for a pumping rate of 400 gpm. This level of interference could have an impact on the yield of TH9-01, depending on the effects of the subsurface boundaries associated with the aquifer. Interference between the east wells and TH1-01 was not considered quantitatively. The boring logs associated with the drilling of wells TH1-01, TH5-01, and TH9-01 do not suggest any connections between the subsurface formations supporting the east wells and TH1-01. Available data are not sufficiently complete, however, to demonstrate that no connection would exist.

To conservatively assess interactions between the east wells and TH1-01, Kohlhase (2001) assumed a perfect connection existed. Using the hydraulic properties determined from the pumping tests and a total pumping rate of 1,325 gpm, which is projected to be the yield from 3 wells in the eastern well field, the calculated potential interference at TH1-01 ranged from 2.5 to 0.1 ft, depending on the choice for the specific yield. This level of interference should be considered a worst case bounding estimate of the potential interference from the operation of all wells at full capacity, with the maximum possible degree of connectivity between the wells.

During normal operating conditions, the wells to be developed as part of the project would be expected to easily provide the 50 gpm (Figure 2.1.6) required for domestic use and boiler feed from the combined sustainable yield estimate of 995 gpm for wells TH5-01 and TH9-01. During periods of extreme drought, the sustained yield from those two wells, as determined from the pumping tests, would be capable of providing about 83% of the total water demand of 1,195 gpm for the proposed plant. Additional wells (up to a total of 6 based on existing groundwater yield information) would be installed to ensure adequate flow rate for the plant and to provide a margin of safety in the event that any of the identified wells should be out-of-service for maintenance. Consequently, the available water resources would be sufficient for the proposed plant, and the municipal well for the village of Elkhart would not be adversely affected from operation of the proposed power plant. Also, because no direct connection between Lake Fork Creek and the groundwater aquifer has been determined to exist, no impact to surface flows would result from use of groundwater to supply all water requirements for the power plant during periods of extreme drought.

Some uncertainty exists in the potential yield of the new groundwater wells and the field drainage system, and this uncertainty becomes more significant when considering the potential consequences of extended drought conditions. In addition, pumping groundwater from the aquifers could induce additional infiltration to occur if the cone of depression developed by the wells or well field intersected the streambed of Lake Fork Creek. To ensure that the water supply for the proposed plant would be adequate and that the municipal water supply for the village of Elkhart would not be adversely affected by power plant operations, monitoring of each well developed for the project would be performed by Corn Belt Energy. The drawdown resulting from well pumping and the associated water quality in the aquifer would be monitored. Criteria would be developed for long-term use and management of the well field that would be installed. Operating procedures, data collection and monitoring, and guidelines for optimizing performance of the new well field would be established, to ensure that the well field would remain a reliable and acceptable source of water, if needed for the proposed plant.

While an existing monitoring well (M8) east of the slurry impoundment at the mine exhibits elevated levels of dissolved solids and other contaminants (Section 3.4.3), adjacent wells do not exhibit similar contamination. The new water supply wells to be installed approximately 2 miles from Well M8 would not be expected to impact the plume of contaminated water in well M8.

Groundwater and surface water use in the State of Illinois is currently regulated under the principal of reasonable use (Beck et al. 1996). Permits are not required for groundwater withdrawals. Similarly, permits are not required for surface water withdrawals, but restrictions may be imposed during periods of low-flows. Any restrictions of this type would not be expected to affect the proposed power plant.

Accidental spills during operation of the proposed power plant would be cleaned in a timely manner and in accordance with a spill prevention, control, and countermeasures plan. Runoff into the Lake Fork Creek watershed and seepage into the ground would be minimal. Surface water runoff that would be collected in the retention pond would not measurably affect Lake Fork Creek.

Tank and vessel storage areas would be enclosed within berms or dikes that would be designed to provide sufficient holding capacity to contain accidental leaks and spills. Most tanks and storage vessels would be expected to be constructed above ground with adequate spill protection. Only an oil-water separator and a wastewater collection basin would be considered for underground installation. All tanks and vessels would be designed to meet applicable codes and standards. Since coal for the power plant would be provided from the Turris Mine's clean coal silo, no effects on surface water or groundwater from leaching of coal storage piles would result. No new coal storage would be required. Waste product from combustion operations at the power plant would be a vitrified (glass-like) material that is essentially inert. Thus, no contaminated leachate from the coal combustion ash would be generated.

## 4.4 GEOLOGY

### 4.4.1 Geology and Seismicity

Buildings and process structures required for the proposed power plant would be designed to withstand a PGA of 0.075 g, which is higher than PGAs that would be expected to occur from seismic activity at the site during the lifetime of the plant. No damage to facilities within the power plant would be expected to result from earthquakes.

Equipment and facilities for the proposed power plant would be installed at a surface location that would minimize the risk of subsidence impact from underground coal mining. The coal resources directly beneath the proposed site, which are owned by Turris Coal Company, have not been mined. The proposed plant would be located beyond the edge of mine workings above a solid block of coal having a minimum width of 600 ft between the closest, neighboring mined coal panels (Figure 3.4.2). The plant area, at the subsurface level of the coal resources, would be bordered by residual barrier pillars of coal separating the plant area from formerly mined areas rather than active mining areas.

The coal removed from the mine at Elkhart is overlain by over 200 ft of unconsolidated overburden, consisting of weak clays, sandy or silty clays, and sand and gravel. Based on an assessment of current geological conditions at the project site (Chugh 2001), subsidence of the land proposed for the power plant would not be anticipated. The slow deformation rates anticipated in the mine floor should dissipate within the unconsolidated overburden, which would avoid major fracturing and temper potential adverse effects by healing small fractures.

Measurements of surface subsidence above room-and-pillar mine workings similar to those beneath the site proposed for the power plant have resulted in *angle of draw* values of 29° for an assumed vertical subsidence of 0.003 ft. The value of 0.003 ft was assumed as the point of *zero deformation* for protection of sensitive LEBS plant equipment, since the equipment would require subsidence protection for a plant lifetime of 35 years and the plant's steam turbine would require stability for efficient operation. The surface distance from a point vertically above the edge of the mine workings to the point of zero deformation is termed the *influence zone*, which represents the extent of potential surface subsidence impact from the mine edge. Figure 4.4.1 depicts these concepts. Assuming a slightly more protective angle of draw of 30°, the influence zone from underground mining on potential surface movement at the proposed LEBS site is shown in Figure 4.4.2.

The impacts from surface deformation due to mined-out areas of the Turris Mine would not be expected to adversely impact the proposed power plant. However, for added protection, plant equipment, particularly the turbine, would be expected to be more centrally located, equidistant from the edges of the nearest zones of influence, as shown on Figure 4.4.2.

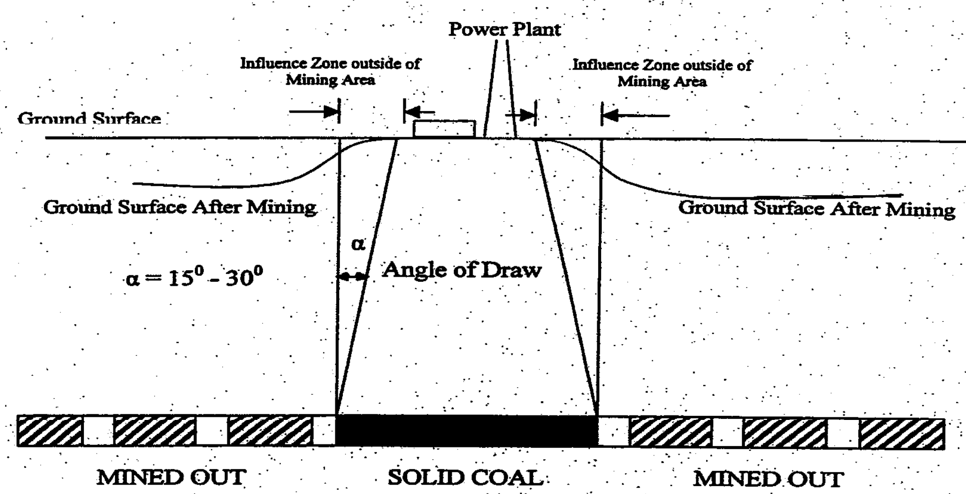


**Figure 4.4.1. Subsidence concepts of Angle of Draw and Influence Zone**

Following plant construction, mining would not occur beneath the project site. Therefore, damage to structures from potential surface subsidence caused by coal mine collapse would not be anticipated. To confirm the status of surface conditions prior to construction, settlement monitoring pins would be installed around the anticipated footprint of the power plant and monitored on a bi-monthly basis.

### 4.4.2 Soil

Construction activities would be performed in accordance with an approved erosion and sedimentation control plan. The plan would designate measures to control storm water runoff and prevent contamination of undisturbed areas during and after construction. Soil compaction and paving on approximately 3 acres of the 5 acre plant site would be required, with a resulting reduction of soil permeability and a corresponding increase in the rate at which storm water run off would occur.

Freshly mined coal contains hazardous organic compounds such as phenol, toluene, naphthalene, anthracene, and pyridine on the newly formed coal surfaces (Meyer 1977). Coal fragments and coal dust containing at least trace quantities of these organic compounds have probably deposited on soil at the 5 acre plant site, which would be adjacent to the existing facilities for coal loading onto trucks. Although not currently anticipated to be required, the plant site would be decontaminated using accepted cleanup practices prior to plant construction if hazardous organic compounds are determined to be present at unacceptable levels.

An Environmental Investigation (MWH Americas, Inc. 2002) was performed to determine the possible presence of soil contaminants at the proposed site. Sediment samples and surface soil samples were variously analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, poly-chlorinated biphenyls (PCBs), and metals. Screening criteria were based on IEPA guidance for Tier I Soil Remediation Objectives for the Industrial/Commercial Worker and Construction Worker scenarios. Results were also compared to the Soil Component of the Groundwater Ingestion Exposure Route to assess the potential for chemical migration to Illinois Class I or Class II groundwater.

The only sediment samples (of 8 collected samples) containing levels of benzene that exceeded (slightly) IEPA's Soil Component of Class I Groundwater Ingestion Exposure Route were two samples obtained at the North Sediment Pond where stormwater from the raw coal storage area flows into the pond. No other VOCs exceeded the IEPA Tier I Soil Remediation Objectives. No SVOCs, pesticides, PCBs, or metals exceeded the Tier I Soil Remediation Objective. No further investigations were considered necessary.

## 4.5 SOLID WASTE

The proposed plant would be designed to minimize the types and quantities of hazardous materials required for plant construction and operation. Where alternatives are available, materials with reduced hazards would be selected. Hazardous bulk material storage and handling facilities (i.e., water treatment systems) would be designed with redundant containment to minimize the impact of spills. If any spills should occur, they would be neutralized manually and cleaning wastes would be removed from the site by an approved waste disposal contractor.

### 4.5.1 Construction

During power plant construction, non-hazardous wastes typically generated during construction activities, comprised primarily of wood, metal, plastic, concrete ingredients and components, etc., would be transported to an off-site sanitary landfill for disposal. Small amounts of hazardous wastes that may be generated during construction would be packaged in 55 gallon drums, temporarily stored on the site in a location protected from the weather, and transported to an off-site licensed hazardous waste disposal facility. Only small quantities of hazardous wastes would be involved, which would preclude any substantive constraints or non-routine requirements regarding hazardous waste management in accordance with regulations under the Resource Conservation and Recovery Act.

### 4.5.2 Operation

The proposed power plant would generate non-hazardous vitrified ash and gypsum. The vitrified ash would be marketed for use as a construction material (e.g., as a road base) or transported for disposal at an approved off-site location. Because a viable market would not be expected for produced gypsum, the gypsum would be transported for disposal as non-hazardous solid waste in an approved disposal location at the Turris Mine or on CBEC property.

Occasionally, clean-out of the electrostatic precipitator and the precipitator ash hoppers would be required. The volume of ash material recovered from clean-out operations and planned for disposal at the Turris Mine would be relatively small compared to the amount of combustion product waste currently accepted for disposal by Turris Coal Company in the slurry impoundment.

Used oil, waste lubricants, and small amounts of other common, maintenance-related hazardous wastes would be generated by plant operations. Primary emphasis for waste management would be devoted to waste recycling. Wastes that cannot be recycled would be temporarily stored on-site in suitable waste storage barrels. The barrels, while on-site, would be stored in an area providing secondary containment. Filled barrels would be transported by an approved waste disposal contractor to a properly licensed disposal site for the produced wastes. The quantities of hazardous waste that would be generated during the operation of the proposed power plant would be expected to be sufficiently low to qualify the plant as a "Small Quantity Generator" under Federal waste regulations.

## 4.6 ECOLOGICAL RESOURCES

### 4.6.1 Terrestrial Ecosystems

No appreciable impacts on terrestrial ecosystems at the site or in the immediate vicinity would be expected during construction or operation of the proposed power plant. The site for the new plant, which has previously been disturbed, includes portions of a mowed field (or lawn), a truck turnaround, and remnants of an old homestead. The site of the proposed 22-acre retention pond is currently used as cropland and, upon completion of the pond, would be surrounded by farming activities and coal handling and processing operations. Other than common animal species, such as rodents, shrews, and small birds, abundant wildlife does not exist on these sites. On-site activities would result in environmental conditions that would be similarly unfavorable for permanent wildlife as those existing in the immediate vicinity due to the annual cycle of crop harvest and field cultivation.

Disturbance of the state-listed natural area on Elkhart Hill (Section 3.6.1) would not be expected to result from additional groundwater withdrawals required for the proposed plant, due to both the distance from the project site and the separation from the site by an intermittent stream that provides an indication of surface water and groundwater flow in a northeasterly direction, away from Elkhart Hill. The uniqueness of this natural area is largely a result of a groundwater supply that provides moist growing conditions for flora. The aquifer that would supply water for the proposed plant (Section 4.3.2) would be obtained from a deeper formation than the near-surface aquifer that supplies Elkhart Hill. Groundwater for Elkhart Hill would be associated with either the Illinoisan Hagerstown member sand or seeps or perched water table conditions, while groundwater for the proposed plant would be obtained from the Pearl formation. Furthermore, the long-term operations of Elkhart Village well #3 since 1984 and the Turris Mine wells have not adversely affected the Elkhart Hill natural area. In addition, the static water levels in Elkhart well #3 have not declined, thus indicating a stable water balance.

The proposed new well (TH1-01) would be developed only if absolutely necessary to meet water requirements during drought conditions, and well usage would be minimal due to its poorer yield conditions compared with wells planned for development east of the project site. The primary groundwater withdrawals for the proposed project would be from alluvial deposits associated with the bottomlands of Lake Fork Creek, which is over 2 miles east of Elkhart Hill. Groundwater investigations have not indicated any connections between the lower aquifer deposits and the Elkhart Hill groundwater. Thus, additional groundwater withdrawal to support the power plant would be unlikely to affect the groundwater supply at Elkhart Hill. Any induced infiltration from the surficial aquifer supplying Elkhart Hill into the deeper aquifer as a result of increased groundwater pumping for the proposed plant would be expected to be sufficiently small that neither the surficial groundwater system beneath Elkhart Hill nor the Elkhart Hill ecosystem would be adversely affected.

### 4.6.2 Aquatic Ecosystems

The proposed plant would be unlikely to affect aquatic resources on or off the plant site. During and after construction of the power plant, most of the on-site water would continue to be recycled for use in coal processing or power plant operations (Section 4.3.2).

As is currently the case, discharges to off-site surface waters, such as Lake Fork Creek, would occur only during those infrequent occasions when rainfall events exceed existing pumping capacities designed to keep all water on the site. As a result, the proposed water retention pond would not produce any sustained impact on Lake Fork Creek, and the partial diversion of water during those infrequent large rainfall events would not substantially change overall flow into the Creek. Because off-site surface waters would not be used to meet water supply needs for the proposed plant, no effects from surface water withdrawal would be expected. The discharge limitations and monitoring requirements of the existing NPDES permit would continue to protect the off-site aquatic environment. The discharge requirements established in the NPDES permit should be protective of aquatic life downstream of the outfalls, given that discharges are rare and typically occur during rain events, when other runoff into the stream would further dilute the concentration of any contaminants released from the site. The concentrations of chemical constituents in water collected in on-site ponds may change during operation of the proposed power plant; however, since the ponds have little ecological significance, no adverse impact would be expected.

### 4.6.3 Threatened and Endangered Species

Because no threatened or endangered species are found on the plant site or in the immediate vicinity (Section 3.6.3), and because the effects of construction and operation related to protected species would be contained substantially on developed or previously disturbed land, no impacts to threatened or endangered species or their habitat would be anticipated. Consultation with the U.S. Fish and Wildlife Service (Appendix A) supports this conclusion.

### 4.6.4 Biodiversity

The proposed power plant would be constructed on previously disturbed property that does not support a diversity of biota. Construction and operation of the proposed power plant would not adversely impact important ecological habitat and would thus have minimal impact on biota. Therefore, the impact on biodiversity at the plant site would be negligible.

Biodiversity in areas adjacent to or in the immediate vicinity of the site proposed for the power plant, beyond the boundaries of the Turris Mine property, would not be affected by power plant operations due to the substantial absence of biodiversity resulting from regional agricultural activities.

Greater biodiversity occurs in the vicinity of Elkhart Hill, which is located about 1 mile northwest of the site proposed for the power plant. Due to the distance of separation, construction activities would not be expected to produce any effects on biodiversity at Elkhart Hill. Relative to ground-level impacts resulting from plant emissions, Elkhart Hill would be considered to be in the "near field" of the plant's air emissions. Biodiversity can potentially be affected by acid deposition resulting from power plant emissions; this deposition primarily results from two sources – from acid formed by atmospheric reactions of water with sulfates and nitrates produced from oxidation of $SO_2$ and $NO_x$ or from direct emissions of sulfuric acid mist. Sulfuric acid mist could be emitted at permissible levels up to a limit of 4.1 lb/hr (Attachment A to the IEPA Construction Permit in Appendix D). The atmospheric reactions necessary to create acidic species from $SO_2$ and $NO_x$ occur over time periods that would not create near-field acidic deposition events, and, in combination with the expected minimal contribution of emissions from the plant to the total quantity of acid rain precursors emitted in the State of Illinois (Section 4.2.2.3), would support a conclusion that emissions from the power plant would not adversely affect biodiversity at Elkhart Hill.

Emissions from power plant operations and conditions that could potentially affect biota around Elkhart Hill are discussed in Section 4.2.2.3.

## 4.7 CULTURAL RESOURCES

The proposed power plant would be unlikely to affect any historical or archaeological resources because no such resources are known to exist on the plant site. The old homestead that formerly existed at the plant site was removed years ago, and the only remaining structures are a few grain bins and a small garage. Consultation with the Illinois Historic Preservation Agency (Appendix B) confirms this finding. Any archaeological resources that might originally have been contained on land that would be affected by construction of the proposed project would have been previously disturbed by agricultural activities and by earth-moving activities during construction of the Turris Mine's surface facilities (buildings, roads, coal storage piles and silos, wastewater ponds, and combustion waste disposal areas). In the unlikely event that archaeological resources would be found during plant construction, work would be stopped immediately and an archaeologist from the Illinois Historic Preservation Agency would be notified to initiate additional consultation.

## 4.8 FLOODPLAINS AND WETLANDS

The proposed site for the power plant is a graded, nearly level area with an approximate elevation of 585 ft (Beittel and Darguzas 1996). The May 1943 flood of record rose to an elevation of 578.5 ft near Cornland. Because Cornland is upstream from the proposed site of the power plant, the power plant site would have experienced a water surface elevation below 578.5 ft during the May 1943 flood of record.

As described in Section 3.8, the plant site would be located in an area that has been determined to be outside the 500 year floodplain (FEMA 1988a). Flooding at the plant site would not be anticipated.

Floodplain encroachment would not occur because the proposed plant would not be constructed on the floodplain of Lake Fork Creek. The plant site would be located approximately 2 miles west of Lake Fork Creek and more than 6 ft above the estimated 50- to >100-year floodplain. Urbanization and industrialization in this rural area are minimal, and encroachment along Lake Fork Creek would be unlikely. Comparison of data from the May 1943 flood with the instantaneous peak water surface elevation of 578.2 ft experienced in the period from 1948 to 1995, as a result of the April 1979 flood, indicates that the water surface rose by about 0.3 ft in response to a flow increase of 20,070 $ft^3/s$ (9 MM gpm). Minimal increase in elevation of the flood water surface occurred because a large land area was available for the water after overbanking had occurred. A large channel cross section resulted from the low topographic relief in the vicinity of the site and the fact that the ground surface is relatively flat with few prominent features.

Construction and operation of the proposed power plant would not result in any stream diversions that would alter existing off-site drainage patterns. The land immediately surrounding the new plant would be appropriately sloped to promote drainage away from structures.

Because the only wetland resources close to the proposed site are along the edges of the Turris Mine ponds and the unnamed ditch, which have little, if any, ecological value, no impacts to wetlands would be expected. Appendix C provides copies of correspondence resulting from consultations with state and Federal agencies on the topic of surface water resources.

## 4.9 SOCIOECONOMICS

Construction of the proposed power plant would create an average of approximately 100 and a peak of about 180 temporary construction jobs in the Elkhart area. Subsequent operation of the plant would create approximately 45 new permanent jobs – 25 for power plant operation and maintenance and 20 for coal mining to provide the additional output required to supply coal to the new power plant.

### 4.9.1 Population

#### *4.9.1.1 Construction*

The following analysis uses the maximum number of 180 construction workers as an upper bound for evaluating potential impacts. Nearly all of the 180 construction workers would be expected to be obtained from the labor force in the area surrounding Elkhart. The cities of Springfield, Decatur, Normal, Bloomington, and Peoria are each within commuting distance of the proposed site and have available workers with the skills necessary to build the proposed plant. For this reason, any in-migration of construction workers to Logan County and the Elkhart area would likely be minimal. To establish a reasonable upper bound for analysis purposes, however, approximately 25% of the construction workforce (45 workers) were assumed to relocate to Logan County during the 24 month construction period.

Based on past experience with construction projects in similar areas, about 60% of the in-migrating workforce (27 workers) would be expected to be accompanied by families and 40% (18 workers) would relocate alone. If the 27 workers who were assumed to bring their families to Logan County would have an average family size of 2.94, the same as for those families currently residing in the county (U.S. Census Bureau 2000), a temporary increase of 97 persons (or 0.31%) would result in Logan County's population. These new residents would probably locate in Elkhart, Lincoln, or other towns and unincorporated areas. However, because of the small number of in-migrating construction workers, no substantive impact on the local area would be expected.

In addition to those workers directly involved in plant construction, a number of indirect jobs would be created in service industries as a result of construction-related expenditures. Based on past experience with construction projects in similar areas, an additional 90 indirect jobs would be expected to result from plant construction. However, only a portion of the indirect jobs would be in Logan County because many construction workers would be expected to live elsewhere and thus contribute to the creation of indirect jobs outside of Logan County. Regardless of their location, all of the indirect jobs, which would typically require less skill and training than would construction jobs, could be readily filled by current residents without any requirements for additional in-migration of workers.

#### *4.9.1.2 Operation*

As indicated previously in Section 4.9, an expected 45 new permanent jobs would be created during operation of the power plant – 25 for plant operation and maintenance and 20 for coal mining. Because plant operations would last considerably longer than construction, commuting from outside the immediate area would be less attractive to many workers and, consequently, a higher proportion of plant workers would be likely to reside in Logan County. Some of the 45 new jobs could be filled by existing residents, while others would be filled by people who would be willing to commute from residences outside the county. For analysis of operations impacts, a level of 50% (23 workers) of the operations period jobs was projected to be filled through in-migration of workers to Logan County.

Based on past experience with startup of new plant operations, approximately 75% of the new Logan County residents (17 workers) would be accompanied by families, with the remaining 25% (6 workers) in-migrating alone. If the 17 workers who would be expected to bring their families to Logan County would have an average family size of 2.94, Logan County's population would grow by 56, or 0.18%. As during the construction period, the small number of new residents would probably locate throughout the towns and unincorporated areas of the county and would have a minimal impact on the local area.

In addition to the 45 workers directly involved in plant operations and related mining, an estimated 23 indirect jobs would be created, but all of these jobs would be expected to be filled by current residents rather than in-migrants.

### 4.9.2 Employment and Income

#### *4.9.2.1 Construction*

If the proposed power plant is built, the number of construction jobs in Logan County would increase by a maximum of approximately 180 and unemployment would decline slightly. This increase would approximately double the number of construction jobs in the county but would be only temporary. In addition, some portion of the 90 indirect jobs created from power plant construction would be filled by Logan County residents, which would contribute to a lowering of the local unemployment rate. Because construction jobs are relatively high paying, average per capita income in the county would probably rise slightly during this period.

#### *4.9.2.2 Operation*

During power plant operations, the number of permanent jobs in Logan County would increase by approximately 45, with 25 of the new positions for power plant operators and maintenance personnel and 20 for coal miners. As during the construction period, a slight decline in the local unemployment rate would result. In addition, a portion of the 23 indirect jobs created from plant operations would be filled by residents of Logan County, which would slightly reduce unemployment.

### 4.9.3 Housing

#### *4.9.3.1 Construction*

The 45 new households that would be created in Logan County to support power plant construction could be easily accommodated by existing housing. The 759 vacant units (Table 3.9.3) in

Logan County provide substantial options to new residents wishing to buy or rent; accordingly, no adverse impacts on local housing would be expected.

#### *4.9.3.2 Operation*

The 23 new households created in Logan County to support power plant operations would be easier to accommodate than would households required by in-migrating construction-period workers. Thus, no adverse impacts would be expected.

### 4.9.4 Public Services

#### *4.9.4.1 Construction*

The short-term influx of 97 new people in 45 households during the construction period would not be expected to strain the capacity of Logan County's public service systems. As described in Section 3.9.4, a number of sewer and water systems are located throughout the county, and the outlying areas also are capable of accommodating new residents through the use of wells and septic systems. Accordingly, the relatively small increase in demand for services caused by project-induced in-migrants during construction would not be expected to have an appreciable adverse effect on the local area.

Based on the county average of 0.78 school-age children per family (U.S. Census Bureau 2000), the 27 in-migrating construction workers that would be accompanied by their families would add 21 children to the Logan County schools. This small number of new students could easily be absorbed by the many public and parochial schools in Logan County without any noticeable adverse effect.

#### *4.9.4.2 Operation*

Because the larger number of in-migrants during the construction period would not be expected to create adverse impacts on the county's ability to provide water and sewer services, the 56 new residents in 23 households anticipated during power plant operations would clearly not lead to adverse effects.

The relocation of 17 operations workers and their families would require Logan County schools to accommodate an additional 13 children. No noticeable adverse impact would be expected.

## 4.10 HUMAN HEALTH

This section focuses on potential health impacts to the public. During construction of the power plant, impacts to the public would result mainly from noise and dust generated by construction activities and from vehicular accidents that could potentially occur due to increased traffic. Noise impacts are discussed in Section 4.12; traffic impacts are discussed in Section 4.13; and air quality issues are addressed in Section 4.2.

During operation, public health effects could result from exposures to toxic chemicals through various routes, including airborne (inhalation) exposures, exposures to contaminated water or food sources, and direct contact exposures. Airborne emissions from the proposed power plant would include $SO_2$, $NO_x$, particulate matter, heavy metals, and organic compounds. However, maximum ambient air concentrations from the proposed plant would be well below levels of concern (Section 4.2).

A potential supplier of aqueous ammonia required for operation of the selective catalytic reduction unit planned for use in controlling $NO_x$ emissions from the proposed plant is located approximately 2 miles from the site proposed for the power plant. The aqueous ammonia required by the plant would probably be purchased from this nearby supplier. Approximately 5,000 gallons of ammonia solution would be stored on the site. The storage and use of aqueous ammonia during normal operations would not be expected to have an appreciable impact on the air or water environments because no intentional releases to the atmosphere would occur. Ammonia in the aqueous solution used by the plant for controlling $NO_x$ emissions would be converted to elemental nitrogen and water.

An accident involving aqueous ammonia leakage or release would provide the only mechanism that could result in a potentially significant off-site impact. Because the distance to the nearest resident would be about 4,000 ft from the plant site (Section 3.11), no need for evacuation would be expected even with worst-case conditions. Under accident conditions, travel might need to be restricted along Township Road 600N (Figure 2.1.2). Before construction and operation of the proposed power plant, a procedure would be developed to comply with OSHA, EPA, and State of Illinois requirements regarding Hazardous Substances and Chemical Accident Prevention regulations. Pursuant to the Emergency Planning and Community Right-to-Know Act of 1986, the power plant would be required to establish and provide Material Safety Data Sheets and other emergency planning information covering all materials and chemicals planned for use to state and local emergency planning committees.

A health hazard could potentially result from catastrophic failures of plant facilities, which might occur during sufficiently severe weather events. The plant would be located in an area that can experience tornadoes, heavy snow, and severe thunderstorms. To protect against failures caused by natural events, the plant and ancillary equipment would be designed using engineering standards that would provide weather-related protection and using building codes appropriate for Logan County and central Illinois. In addition, the plant would be equipped with a modern control system capable of safely responding to weather events that could potentially result in adverse effects on plant operations.

Atmospheric releases from the proposed power plant would provide the major potential source of exposure to hazardous substances. The other potential exposure pathways (i.e., food, water, and direct contact) would have a low potential because the pathways are not complete. For example, any liquid discharges and solid wastes with potential for creating health hazards would be sent to settling ponds at the Turris Mine. All ash would be recycled to the combustion unit, calcined during combustion, and removed from the system as vitrified bottom ash. Uptake through food sources would be negligible because the only pathway would be from atmospheric deposition, and the air analysis (Section 4.2) demonstrated that air concentrations at receptor locations would be small and that deposition onto soils, for potential uptake by plants, or directly onto edible parts of plants, would be even smaller.

Electrical power transmission lines produce electromagnetic fields. The Turris Mine currently receives electricity from transmission lines, and the proposed power plant would tap into the existing lines. New transmission lines and towers would only be required to connect a new transformer for the power plant with an existing substation on the Turris Mine property. The new lines and towers would be confined to the mine property. Electricity marketed from the power plant would use the existing transmission lines.

The issue of electromagnetic fields potentially affecting human health has received increased interest over the last decade. The National Radiological Protection Board (1992) has stated: "The epidemiological findings that have been reviewed provide no firm evidence of the existence of a carcinogenic hazard from exposure of paternal gonads, the fetus, children, or adults to the extremely low frequency electromagnetic fields that might be associated with residence near major sources of electricity supply, the use of electrical appliances, or work in the electrical, electronic, and telecommunications industries." Because the proposed power plant would require no new off-site transmission lines and because the nearest residences would be located about 4,000 ft from the mine boundary, the power plant would not be expected to change the existing level of effects, if any.

In summary, no appreciable impacts to public health would be anticipated from construction and operation of the proposed power plant.

## 4.11 WORKER SAFETY

Workers would be protected during both construction and operation through compliance with OSHA regulations and company policies and procedures, as described below.

### 4.11.1 Construction

An average of approximately 100 workers would be employed during construction of the power plant. Physical hazards associated with plant construction would be considered standard industrial hazards. Construction workers would be protected through compliance with OSHA's *Safety and Health Regulations for Construction* (29 CFR 1926) and the corporate procedures of CBEC and Turris Coal Company, as appropriate.

In 1993, approximately 47 disabling injuries were reported for every 1,000 workers in the U.S. construction industry. Most accidents and injuries resulted from overexertion, falls, or being struck by equipment (NSC 1994). Assuming the same injury rate at the proposed power plant, approximately 10 injuries would statistically be expected to occur during the 24-month construction period for the power plant. Construction-related illnesses could also occur from exposures to chemical substances, but rates for standard construction are low and none would be expected during construction of the proposed power plant.

### 4.11.2 Operation

Potential impacts to workers during plant operation would be expected to be limited to standard industrial hazards associated with operation of a coal-fired power plant. No unusual situations would make operation of the proposed power plant more hazardous than normal power plants. Programs would be developed to minimize employee health and safety risks during operation. Safety programs would cover all aspects of OSHA compliance, employee safety and health, industrial hygiene, and fire protection, prevention, and training, as described in 29 CFR 1910, *Occupational Safety and Health Standards*. Physical hazards to workers during operation could include, but are not limited to, equipment accidents, noise, heat stress, and confined spaces. OSHA provisions have been established and successfully applied in industrial operations to mitigate these types of safety hazards.

## 4.12 NOISE

Ambient noise would increase both during construction and operation of the proposed power plant. During construction, noise would be intermittent and would vary with different activities, such as ground clearing and excavation. Earthwork and associated activities would result in generation of noise from operation of vehicles and heavy equipment. Maximum noise levels from such activities typically range from 85 to 90 dB(A) at a distance of about 50 ft from the source (EPA 1978). Noise from construction could be above background for the rural area immediately outside the Turris Mine's boundaries, and some sounds could be perceptible and distinct to the nearest residents (about 4,000 ft from the plant site). Such noises might include backup alarms on trucks and any impact noises, such as those associated with pile drivers. However, sound levels decrease by 6 dB for each doubling of the distance from the source if no absorption of sound energy occurs. Therefore, expected noise levels from construction of the proposed power plant would be less than 54 dB(A) at a distance of 3,000 ft from the site. EPA (1978) has identified 55 dB(A) as a yearly average noise level that, if not exceeded, would avoid activity interference and annoyance. In addition, noise impacts from power plant construction would be minimized because construction activities would occur mostly during daylight hours and would not be continuous.

During power plant operations, noise would be produced from the boiler building, turbines, fans, generators and transformers, and cooling tower fans. Based on similar sized units (DOE 1995), sound levels at 1,000 ft to 1,500 ft would be approximately 45 dB(A) and at 4,000 ft would decrease to below 35 to 40 dB(A). Thus, under most circumstances, the nearest residents should not experience any annoyance from noise produced during power plant operation. Under unusually quiet circumstances, a general background hum may be perceptible, but such low noise levels should be below levels of annoyance. Periodic short-duration operational events, such as blowdowns that produce elevated noise levels, may be restricted to daytime hours to minimize effects.

## 4.13 TRAFFIC

During the peak construction period, up to 180 new workers in passenger vehicles would travel to and from the proposed power plant on a daily basis. In addition, peak construction-related truck traffic would total 75 round-trips per day during the pouring of concrete foundations for the plant. During plant operations, a maximum of 45 daily round-trips by new plant operators, maintenance workers, and miners would be required. New truck traffic during this period would be less than during plant construction, amounting to a maximum of 35 daily round-trips for the delivery and removal of materials. If all of the trucks used for deliveries would also remove materials, the total number of new daily round-trips by trucks during power plant operations would be reduced.

Existing on-site and off-site transportation corridors have sufficient capacity to handle the expected increase in traffic during construction and operation of the proposed power plant. Increased truck traffic would follow commercial or designated routes already used and appropriate for truck traffic. Periodic deliveries of liquid ammonia from the likely supplier (Section 4.10) would also be made in approved containers using commercial or designated routes and properly placarded vehicles. Township Road 600N (Figure 2.1.2), which would provide access to the proposed site, is a wide, two-lane paved road that currently experiences no congestion (Section 3.12). Because Township Road 600N has easily accommodated a daily workforce of 240 in the past, the addition of up to 180 daily round-trips by construction workers and up to 75 trucks per day for hauling construction materials would not be expected to substantially diminish the road's ability to accommodate traffic requirements. Because the proposed plant would have a separate entrance from Township Road 600N, no interference with coal trucks being loaded on the Turris Mine property would be anticipated.

The number of worker vehicles and trucks traveling to and from the plant site during operations would be substantially less than during the construction period; thus, no adverse impacts to traffic flow on Township Road 600N would be expected. Truck traffic during operations would be associated primarily with the delivery of ammonia and limestone and with the transport of vitrified ash and gypsum from the site for sale or disposal. No special designation would be required to deliver ammonia for the power plant on roads in Logan County (R. Fox, Logan County Highway Engineer, personal communication to M. Schweitzer, ORNL, June 9, 1998). If necessary due to unavailability of markets for vitrified ash, a conveyor would be installed to move ash from the power plant to the Turris Mine's waste disposal ponds, which would reduce on-site traffic and traffic crossing Township Road 600N.

Traffic accidents during deliveries of plant feedstocks or removal of plant products could potentially result in releases of chemical materials into the environment. The primary solid materials of interest would limestone, vitrified ash, and gypsum, each of which is non-hazardous in nature. Any accidental spillage of these materials would be contained and readily cleaned for disposal by personnel using appropriate protective equipment, such as eye protection and protection from airborne dust particles.

Ammonia requirements for the $NO_x$ control system planned for the power plant would be transported to the site as an aqueous solution with a maximum ammonia concentration of 19%. Ammonia solutions containing ammonia at concentrations greater than 10% are corrosive. Skin contact with such solutions can result in burns, and ingestion can be fatal. Accidental spills would require isolation to avoid contact by unprotected persons. Containment and recovery would require hazardous material-trained personnel using personal protective equipment (respirators and impervious clothing). Residues should be diluted with water and neutralized with dilute acid. The neutralized spill would require final cleanup through absorption on clay, sand, earth, or other inert substance and packaging in a suitable container for disposal. Ammonia in an aqueous solution at the low concentration planned for use would vaporize slowly from the aqueous solution if spilled and either dissipate into the atmosphere or be absorbed by materials that it contacts; potentially hazardous vapor clouds of ammonia would not be formed.

Limestone would be transported to the site in an aggregate form, with particle sizes ranging in diameter from 1 to 4 inches. The limestone would be off-loaded from trucks into a covered, three-wall enclosure and stored until crushed and slurried. Any spillage of the limestone chunks would be cleaned-up as quickly as practical.

Vitrified ash would present little spill risk and would be transported off-site after being crushed to a consistent size range for easy handling. Any spill of this material would pose no threat to the environment and would be cleaned-up as quickly as practical.

Gypsum transported from the plant would possess sufficient moisture to avoid atmospheric release. If spilled, gypsum would not threaten the environment but would be cleaned-up as quickly as practical.

## 4.14 LAND USE

The proposed power plant would produce minimal adverse impacts on land use. The power plant would be constructed and operated within the boundaries of the Turris Mine's property. The land uses of property surrounding the proposed plant site are agricultural and industrial. The proposed power plant would be accessed by existing roads and would be located on 5 acres of industrial property owned by Turris Coal Company. An additional 22 acres of land that is currently leased for agricultural cultivation would be used for constructing a water retention pond.

The 5-acre site proposed for the power plant would border the northern side of Township Road 600N and is currently designated as the emergency coal storage area for the mine (Beittel and Darguzas 1996) (Figure 2.1.4). The site contains a paved loop road that is used by truck traffic to access the mine's coal loading facilities and a mowed grassy field that has, to date, not been required to provide emergency coal storage for the mine. The site has been partially disturbed by truck traffic on the loop road, and both the truck loading operations and the proximity of the site to the coal mine have probably resulted in deposition of coal fragments and coal dust onto the soil. The 22-acre property proposed for the retention pond would be removed from corn and soybean production. Based on the large amount of land in Logan County that is used for corn (about 180,000 acres) and soybean (about 165,000 acres) production, the impact of removing from crop production acreage that accounts for approximately 0.01% of the land devoted to production of these two crops in Logan County would be negligible.

Construction and operation of the proposed power plant would be consistent with the existing use of on-site property and facilities for coal mining but would contrast with the agricultural uses occurring on surrounding off-site lands. The 5-acre parcel of land for the power plant would be transformed from a well maintained, seldom used field into an industrial site, and the 22 acres of cropland would be transformed from crop production into a retention pond. The Turris Mine would not be impacted because 248 acres of mine property would remain unused for mining-related operations and available for designation of an alternative, similar-sized area (e.g., 5 acres) for emergency coal storage.

Operation of the proposed power plant would require a collective total of approximately 5 acres of additional land surface beyond the Turris Mine property to provide infrastructure support for the power plant. Land that is currently used for agricultural purposes, primarily for growing corn and soybeans, would need to be purchased or leased for the new wells near Lake Fork Creek, access roads to the wells, and rights-of-way/easements to the plant site for well water and natural gas delivery lines.

Operations at the Turris Mine would continue in a normal manner following initiation of power plant construction and operation. Permits for the Turris Mine would continue to be required from the Illinois Department of Mines and Minerals, the Illinois Environmental Protection Agency, the Illinois Department of Transportation, the Mine Safety and Health Administration, the Illinois Department of Natural Resources, and the Bureau of Alcohol, Tobacco, and Firearms.

## 4.15 ENVIRONMENTAL JUSTICE

The analysis in Section 4.10 (Human Health) indicates that no adverse health effects to any individuals or households present in the vicinity of the proposed power plant would be expected. In addition, because the percentages of minorities and low-income households in Elkhart are less than those in Logan County and Illinois (Section 3.14), no disproportionate adverse effects on low-income or minority populations would be expected.

## 4.16 POLLUTION PREVENTION MEASURES

The proposed power plant would include pollution prevention measures that would be developed and implemented as part of the plant design or in response to potential or actual impacts identified during construction and operation of the plant. Pollution prevention measures are discussed in Sections 2.0 and 4.0 and summarized in Table 4.16.1.

**Table 4.16.1. Pollution prevention measures developed for the LEBS power plant**

| Environmental issue | Pollution prevention measure |
|---|---|
| Aesthetics | • Dust suppression measures (i.e., watering) would be used to minimize the occurrence of fugitive dust during construction period excavation and earthwork. |
| Air quality | • The proposed power plant would demonstrate improvements in pollutant reduction levels compared with current coal-fired electric power generation. Concentrations of $SO_2$, $NO_x$, and $PM_{10}$ in exhaust gases would be below applicable standards for pollutant emissions.<br>• Dust suppression measures (i.e., watering) would be used to minimize emissions of particulate matter during construction period excavation and earthwork. |
| Water use and quality | • The proposed power plant would result in no net consumption of non-potable water from the mine's recirculating water distribution system, which draws water from ponds fed by storm water runoff.<br>• During operation of the proposed power plant, most on-site water, whether originating from groundwater or precipitation, would continue to be recycled for use in coal processing or would be used in power plant operations. |